THE VISUAL SYSTEM IN FLIGHT

TERMINAL LEARNING OBJECTIVE

- Action: Manage the effects of visual limitations during flight
- Conditions: While performing as an aircrew member
- Standards : IAW FM 3-04.301, FM 8-50, AR 40-501, and AR 40-8

PHOTORECEPTOR CELL

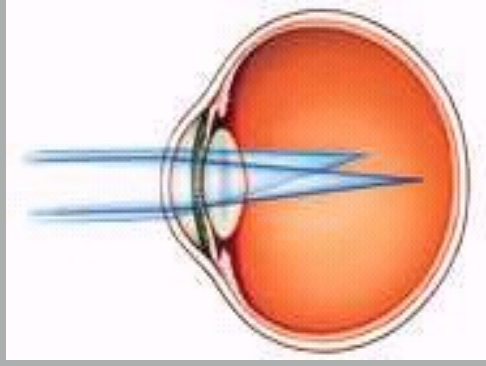
- Cone cells only
- Periods of bright light
- Identifies colors
- Sharp visual acuity and color sense
- 7 million in fovea and parafovea regions
- 1:1 ratio of cone cells to neuron cells

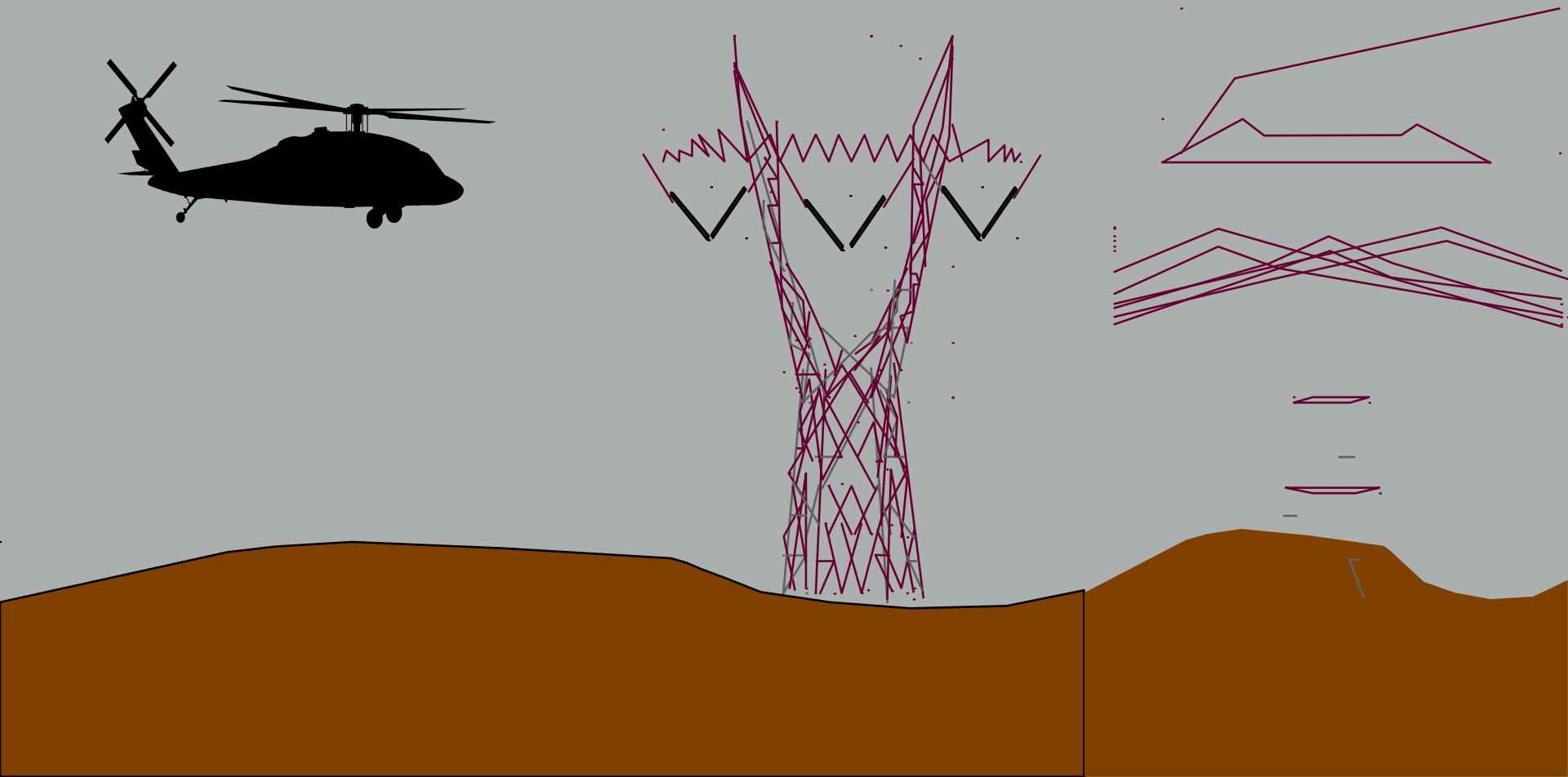
QUESTIONS ?

VISUAL DEFICIENCIES

- ASTIGMATISM
- MYOPIA
- HYPEROPIA
- PRESBYOPIA

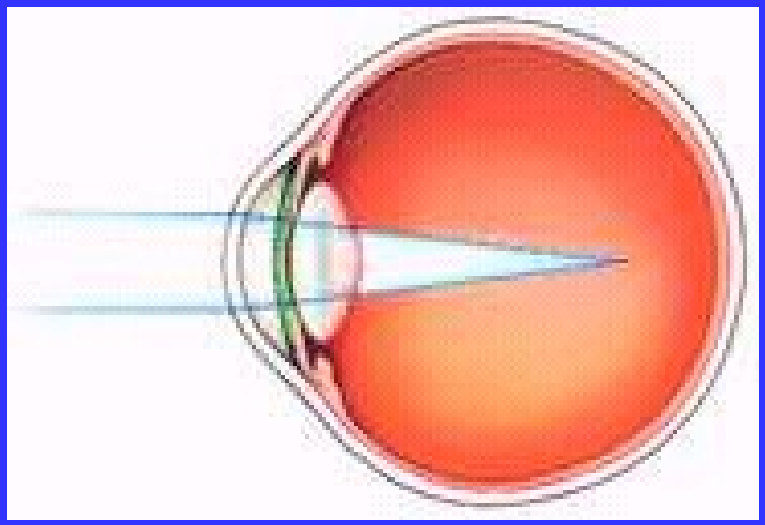
ASTIGMATISM

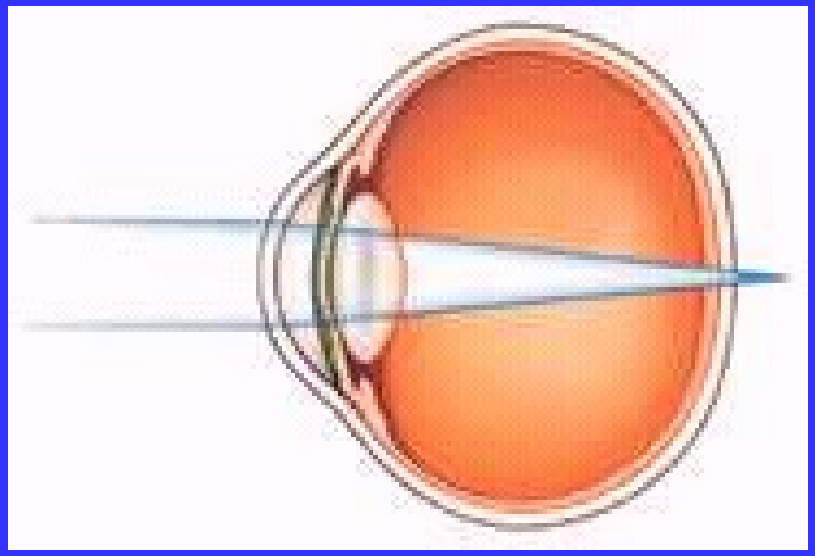




VISUAL DEFICIENCIES

Myopia: Nearsightedne





Hyperopia: Farsightedness

Presbyopia: (aging) Hardening of lens, loss of ela

QUESTIONS ?

RADIAL KERATOTOMY

- Flattening of the cornea by the creation of spoke like incisions
- Performed to correct abnormal curvature of the cornea

LASER IRIDOTOMY

- A lazed opening of the iris to open ocular fluid passageways
- Performed for the treatment of glaucoma
- Creates artificial pupil (Lost peripheral vision non-correctable)

PHOTO REFRACTIVE KERATECTOMY

(PRK)

LASER instu KERTOMILEUSIS (LASIK)

QUESTIONS ?

PHOTOPIC VISION

- **Daylight or bright light**
- **Central vision**
- **Color sense and image sharpness**
- **Visual acuity 20/20**

QUESTIONS ?

BINOCULAR CUES

- Valuable only when object is close
- Each eye has a slightly different view
- Operates subconsciously

MONOCULAR CUES (GRAM)

- Object seen as one picture
- Are derived from experience
- Subject to interpretation

GEOMETRIC PERSPECTIVE

- OBJECTS have different shapes when viewed at varying distances and altitudes

GEOMETRIC PERSPECTIVES

Linear perspectives

Vertical position in the field

Apparent foreshortening

RETINAL IMAGE SIZE

- **K**nown size of objects
- **I**ncreasing or decreasing size of objects
- **T**errestrial association
- **O**verlapping contours

KNOWN SIZE OF OBJECTS

DECREASE IN SIZE

INCREASE IN SIZE

TERRESTRIAL ASSOCIATION

OVERLAPPING CONTOURS

AERIAL PERSPECTIVE

- Distant information gained by clarity of object viewed or by the shadow it casts

FADING OF COLORS AND SHADES

LOSS OF DETAIL OR TEXTURE

LIGHTS AND SHADOWS

MOTION PARALLAX

- Very important cue to depth perception
  - ✈ Stationary objects
- Rate depends on the distance of the object

QUESTIONS?

FLIGHT HAZARDS

- SOLAR GLARE
- BIRD STRIKES
- LASERS
- NERVE AGENTS

SOLAR GLARE

BIRD STRIKES

LASER

- LASER

  Light

  Amplification by a

  Stimulated

  Emission of

  Radiation

LASER

- Intense, narrow beam of light, less than 1 inch in diameter
- Widens with distance: 2km-diameter is 2 meter

LASER INJURIES

- Lens: Focuses and concentrates light rays entering the eye
- Concentration of energy through the lens is intensified 100,000 times greater than the normal light entering the eye

LASER INJURIES

- Amount of damage depends on laser type, exposure time, and distance from the laser
- **Types of injuries:**
  - Tiny lesions on the back of the eye
  - Flash blindness
  - Impaired night vision
  - Severe burns effecting vast body portions

LASER PROTECTIVE MEASURES

Passive:

- Take cover
- NVD’S
- Squinting
- Protective goggles

Active:

- Counter measures taught or directed
- Evasive action
- Scanning with one eye or monocular optics

NERVE AGENTS

- Threat present both day and night at low level flight
- Direct or minute exposure will cause **miosis** (pupil constriction)
- Severity of miosis depends on agent concentration and cumulative effects of repeated exposure

NERVE AGENT SYMPTOMS

- Range from minimal to severe (dosage to eye?)
- Severe miosis may persist for 48 hrs
- Complete recovery may take up to 20 days
- Consult flight surgeon immediately

QUESTIONS?

SELF-IMPOSED STRESSES

- Drugs
- Exhaustion
- Alcohol
- Tobacco
- Hypoglycemia

QUESTIONS?

SUMMARY